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U.S. Fish and Wildlife Service
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AESO/SE
02-21-02-F-0220

October 4, 2002

Mr. John C. Bedell
Forest Supervisor
Apache-Sitgreaves National Forest
P.O. Box 640
Springerville, Arizona 85938-0640

RE: Crayfish Study in Nutrioso Creek

Dear Mr. Bedell:

Thank you for your request for consultation with the U.S. Fish and Wildlife Service pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your June 10, 2002, request for formal consultation was received on June 12, 2002. This biological opinion is based on our review of the May 30, 2002, biological assessment and project proposal, telephone conversations with Terry Meyers, and other sources of information regarding a proposed crayfish study in Nutrioso Creek, Apache County. At issue are impacts that may result from the proposed project on Little Colorado spinedace (*Lepidomeda vittata*). Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, and its effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

Consultation History

- May 7, 2002, informal discussions regarding this project began.
- May 30, 2002, we received your request for formal consultation.
- June 19, 2002, we notified the Forest Service of our intent to issue a final biological opinion by October 30, 2002.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is to issue a Forest Service permit to conduct research on crayfish in Nutrioso Creek. The research will take place during summer for one day. Five baited (with cat food) Gee minnow traps (Size 9" x 17.5" with 2" diameter funnels at both ends, 1/4" mesh) will be placed in a pool habitat within 3 miles (mi) (5 km) downstream or upstream of two USGS stream gauges (Appendix A, Map 1; USGS site numbers 9383500 and 9383550 on Nutrioso Creek) before sunset. The traps will be retrieved between 7:30 a.m. and 12:00 p.m. the following day. Crayfish will be sexed and measured to the nearest millimeters using calipers. Any fish caught in the traps will be returned to the stream. Up to 10 crayfish specimens will be preserved in 70% ethanol and transported back to the lab for identification. Water pH will be measured using a portable pH meter. Dissolved oxygen, specific conductivity, and water temperature will be measured using an YSI85. Two water samples 0.67 ounces (20 milliliters (ml)) will be taken back to the lab for calcium analysis. Water depth, substrate composition, and cover availability will be measured in the pool at five locations along each of five equally spaced transects (for a total of 25 locations).

The action area considered in this consultation includes all areas affected directly or indirectly by the Federal action. Since traps will be placed in two separate pool habitats in Nutrioso Creek the entire pools will be considered within the action area.

STATUS OF THE SPECIES (range wide and/or recovery unit)

The Little Colorado spinedace was listed as threatened with critical habitat on October 16, 1987. Forty-four stream miles of critical habitat were designated: 18 mi of East Clear Creek immediately upstream and 13 mi downstream from Blue Ridge Reservoir in Coconino County, 8 mi of Chevelon Creek in Navajo County, and 5 mi of Nutrioso Creek in Apache County. The spinedace is a cyprinid native to the Little Colorado River (LCR) drainage. This fish occurs in disjunct populations throughout much of the LCR drainage including Apache, Coconino, and Navajo counties.

The species was described in 1874 by E.D. Cope (Miller and Hubbs 1960). Extensive collections summarized by Miller (1963) indicated the spinedace had been extirpated from much of this historic range during the period 1939 to 1960. Although few collections were made of the species prior to 1939, the species is believed to have inhabited the northward flowing tributaries off the Mogollon Rim, including the northern slopes of the White Mountains.

The spinedace is a small (about 4 in) minnow with olivaceous, bluish or lead grey coloration. Habitat requirements include a wide range of stream habitats ranging from stagnant pools to permanent flowing water, and with stream substrates ranging from fine sediments to bedrock. Water temperatures in occupied habitats ranged from 58 to 78 degrees Fahrenheit (Miller 1963).

Miller (1963) called the spinedace “trout like” in behavior and habitat requirements. Prior to 1900, the spinedace likely used habitats now dominated by nonnative salmonids. Food habits of spinedace include chironomid larvae, dipterians, filamentous green algae and crustaceans (cladocerans) (Runck and Blinn 1993).

Rainbow trout predation on spinedace was demonstrated by Blinn and Runck (1990) in aquaria experiments. Trout obtained from Nutrioso Creek consumed spinedace in aquaria with and without rocks providing cover. Spinedace did not appear capable of avoiding trout predation when placed in aquaria. The largest spinedace consumed by a rainbow trout was 2.8 in; the trout was 9.5 in (Runck and Blinn 1993). However, "domesticated" trout obtained from the Page Springs hatchery did not consume spinedace. Robinson et al. (2000) examined stomach contents of 54 rainbow trout captured from Nutrioso Creek and the Little Colorado River and detected no predation on spinedace.

Although the spinedace exhibits a wide tolerance of habitat types, their overall numbers appear to be declining. The primary reasons believed responsible for decline are changes in water quality and quantity, modification of watersheds (dams, road construction), and interactions with nonnative fishes. Spinedace population estimates fluctuate drastically from year to year. Between 1963 and 1966, spinedace were readily found throughout much of the habitat where they had been collected in the recent past, indicating the species ability to persist through severe drought conditions and severe winter temperatures yet repopulate when physical conditions improved. Spinedace are late spring-early summer spawners. Five spinedace populations are known to occur within the LCR: Chevelon, Silver, Nutrioso, East Clear Creek, and the LCR proper. Many of the spinedace locations are irregularly surveyed, the last collection of spinedace from various populations are summarized below (Table 1). This table does not, however, quantify the number of spinedace, or provide information on population trends, stability, or the quality of the habitat.

Native fishes associated with spinedace include speckled dace, bluehead sucker, Little Colorado sucker, roundtail chub, and Apache trout (USFWS 1998). The list of non-native fishes is much greater and with varying degrees of potential effects to the spinedace's long-term survival. The presence of nonnatives may have contributed to the current disjunct distribution patterns and the species retreat to what may be suboptimal habitats for spinedace. Nonnative fish may compete with, prey upon, harass, and alter habitat utilized by native fish fauna. Although spinedace numbers fluctuate greatly, overall, their numbers appear to be declining.

Table 1. Known populations of Little Colorado spinedace and last known collection date.

SPINEDACE POPULATIONS	Last Year Species documented as of 2002
CHEVELON CREEK Above The Steps Hugo Meadow The Steps	1998 ¹ 1998 ¹ 1998 ¹
SILVER CREEK Silver Creek Cottonwood Wash	1997 ¹ 1974
NUTRIOSO CREEK Above Forest Service Boundary Upstream of Nelson Correjo Crossing Rudd Creek	2000 ¹ 2000 ¹ 2000 ¹ 1999 ¹
EAST CLEAR CREEK Above Blue Ridge Below Blue Ridge Leonard Canyon - Dines Canyon West Leonard Canyon Mid-Leonard Canyon Yeager Canyon Houston Draw General Springs	1995 ¹ 1998 ¹ 2002 ¹ 2002 ¹ 1994 2000 stocked / 2002 ¹ 2000 stocked 2000 stocked
LITTLE COLORADO RIVER Downstream of Salado Clear Creek Willow Creek Upstream of Lyman Winema Downstream of Lyman	1939 1960 1965 - 2001 ¹ 1995 ¹

¹~~Date of last survey.~~

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

A. Status of the species and critical habitat within the action area

The Little Colorado River spinedace population in the Nutrioso Creek watershed is stable and fairly common only within a portion of Nutrioso Creek. Spinedace habitat is limited by perennial flows and non-native aquatic species in the tributaries of Nutrioso Creek.

Little Colorado River spinedace are found in Nutrioso Creek from about the Milk Creek/town of Nutrioso area to Nelson Reservoir. Downstream of Nelson Reservoir, critical habitat has been designated from the dam to the National Forest boundary, a distance of 5 miles. Water quality and quantity is affected by the dam and close proximity of the highway and roadcuts. Spinedace occurred in Rudd Creek on the Sipes White Mountain Ranch until the drought in 1996, when the known site dried completely.

According to Blinn et al. (1993) Nutrioso Creek is a first through third-order stream in eastern Arizona that drains the northern slopes of the White Mountains in Apache County. The headwaters of this small perennial stream (1.64- 8.20 ft wide, .32 - 3.28 ft deep) originate at an elevation of 8,136 ft in a spruce-fir forest. The stream meanders through treeless alpine meadows for about 24.8 mi where it eventually joins the Little Colorado River (<9,514 ft). Upper reaches (first 6.2 mi) consist of cobble riffles and maintain relatively low temperatures (<68°F) and clear water whereas lower reaches consist of pools with organic-rich sediments, relatively high temperatures (>77°F) and turbid water during the summer.

Approximately 5 miles of Nutrioso Creek from the Apache-Sitgreaves National Forest boundary upstream to the Nelson Reservoir dam are designated critical habitat for the Little Colorado spinedace. This stream was designated because it supports healthy, self-perpetuating populations of Little Colorado spinedace (USFWS 1998). It provides all of the ecological, behavioral, and physiological requirements necessary for the survival of the species. Any action that would deplete the flow, significantly alter the natural flow, alter the channel morphology, or alter the water chemistry of Nutrioso Creek would adversely affect critical habitat within (USFWS 1998). Critical habitat within the action area is thought to be degraded physically and inhabited by many non-natives (Terry Myers, US National Forest, pers. comm.)

Stream alteration, watershed modification, and introduction of non-native fishes pose an increasing threat to the Little Colorado spinedace (USFWS 1998).

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

The proposed action will capture fish and crayfish from two pond habitats in Nutrioso Creek. The traps placed in Nutrioso Creek will be in occupied Little Colorado spinedace habitat. Since the traps used are designed to trap minnows, it is very likely that Little Colorado spinedace as well as crayfish will be caught. As Yoon (2002) described, when trapped together, crayfish opportunistically prey upon other fish in the trap, and survival rates of fish in the traps decreases. Therefore, it is probable that Little Colorado spinedace will be preyed upon by crayfish.

Crayfish inhabit a wide range of well-oxygenated ponds, lakes, and streams at elevations from 3,900 - 8,300 feet (Dean 1969). Crayfish are omnivorous. Dean (1969) reported that of 110 crayfish stomachs, 54% were empty; algae (51%), vascular plant fragments (27%), detritus (18%), and animal food (4%) occurred in the remaining stomachs. The animal foods included snails, young crayfish, and fish (no species given). According to Dean (1969) crayfish prefer fresh animal flesh over plant material in aquaria and frequently attack trout on stringers in lakes around northern Arizona. In aquaria, crayfish attempted to capture live fish (no species given) but were rarely successful except with young of the year channel catfish (*Ictalurus punctatus*) and green sunfish (*Lepomis cyanellus*) (Dean 1969).

One study performed by Yoon (2002) observed the interaction between crayfish and benthic fish in isolation cages in the wild and in observational tanks in a controlled setting. Yoon's (2002) results showed that survival rates of fish were significantly lower ($p < 0.05$) when crayfish are present. In each of the control cages containing only fish and no crayfish, no fish mortalities occurred during the experimental period of ten days. However, in the experimental treatments where crayfish were added to the cages, only two fish survived. In the observational tanks in the study, crayfish did not actively chase the fish, but would grab and hold on to the fish using their chelae or pincers while caging it between their other appendages when the fish swam within striking distance (Yoon 2002). In addition, crayfish were seen feeding on minnows despite supplemental feeding with cat food pellets, fish food, and aquatic worms (Yoon 2002).

Jerry Ward, Fishery Biologist for the Apache-Sitgreaves National Forest, mentioned that during the summer of 2002, approximately 75% of Nutrioso Creek dries up causing Little Colorado spinedace to congregate in pools of water (pers. comm. July 11, 2002). These pools of water will also be the place where minnow traps will be placed to catch crayfish. This will lead to a higher probability of spinedace and crayfish interacting in the minnow traps, and in turn to a higher number of Little Colorado spinedace consumed by crayfish.

Traps placed in Nutrioso Creek below Nelson Reservoir will be in designated critical habitat. However, the placement of traps within the creek for a 24-hour period will not produce any significant effects to critical habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Since the entire

project area is within the Apache-Sitgreaves National Forest, all legal actions likely to occur are considered Federal actions.

CONCLUSION

After reviewing the current status of the Little Colorado spinedace, the environmental baseline for the action area, the effects of the proposed trapping of crayfish in Nutrioso Creek and the cumulative effects, it is the Fish and Wildlife Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Little Colorado spinedace, and is not likely to destroy or adversely modify designated critical habitat.

We present these conclusions for the following reasons:

1. The action is going to be of short duration (24 hours) and,
2. The Little Colorado spinedace is found in East Clear Creek and its tributaries (Coconino County), Chevelon and Silver creeks (Navajo County), and Nutrioso Creek and the Little Colorado River (Apache County) in Arizona. The proposed action affects a very small portion of the species' range within the Little Colorado River drainage.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Fish and Wildlife Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Forest or

permit applicant so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Forest must report the progress of the action and its impact on the species to the Fish and Wildlife Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The Fish and Wildlife Service anticipates that all Little Colorado spinedace caught in the minnow traps will be taken as a result of this proposed action. The incidental take is expected to be in the form of death, wounds, trapping, or harassment. Death will occur to those individuals eaten by the crayfish. Of the spinedace caught, some may be further wounded by the crayfish and/or by being caught in the traps. Little Colorado spinedace that are caught in the traps but not eaten will be harassed since their normal behavior pattern will be disrupted. Total take is estimated to be 10 fish.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The following reasonable and prudent measures (and associated terms and conditions) are necessary and appropriate to minimize take of Little Colorado spinedace. In order to be exempt from the prohibitions of section 9 of the Act, the Forest must comply with the terms and conditions and required reporting/monitoring requirements. The terms and conditions which implement the reasonable and prudent measures are non-discretionary.

1. The Forest shall minimize interactions between spinedace and crayfish.
 - 1.1 All crayfish caught that are not preserved as specimens will be removed from the stream system and disposed of.
2. The Forest shall monitor incidental take resulting from the proposed action and report to the Service the findings of that monitoring.
 - 2.1 The Forest shall report all fish caught in the minnow traps and report these findings to the Arizona Ecological Services Field Office within 60 days of the completion of trapping on the Forest.

Review requirement: The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent

measures provided. The Forest must immediately provide an explanation of the causes of the taking and review with the AESO the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that the modified minnow trap (Appendix B) be used by the researcher to minimize take of Little Colorado spinedace. However, if using the modified trap compromises the integrity of the study, the design does not have to be utilized.
2. We recommend that the researcher conduct this study in another stream where threatened and endangered species do not occur.
3. We recommend that your agency work with Arizona Game and Fish Department and other land management agencies to develop, fund, and implement actions to help Little Colorado spinedace recovery, including:
 - a. renovation and repatriation efforts across the species' range;
 - b. reduction in abundance and distribution of exotic fish species in key recovery areas;

In order for the Fish and Wildlife Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the proposed crayfish study as outlined in the consultation request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Fish and Wildlife Service appreciates the Forest Service's efforts to identify and minimize effects to listed species from this project. For further information please contact Jennifer Graves (x232) or Debra Bills (x239). Please refer to the consultation number, 02-21-02-F-0220, in future correspondence concerning this project.

Sincerely,

/s/ Steven L. Spangle
Field Supervisor

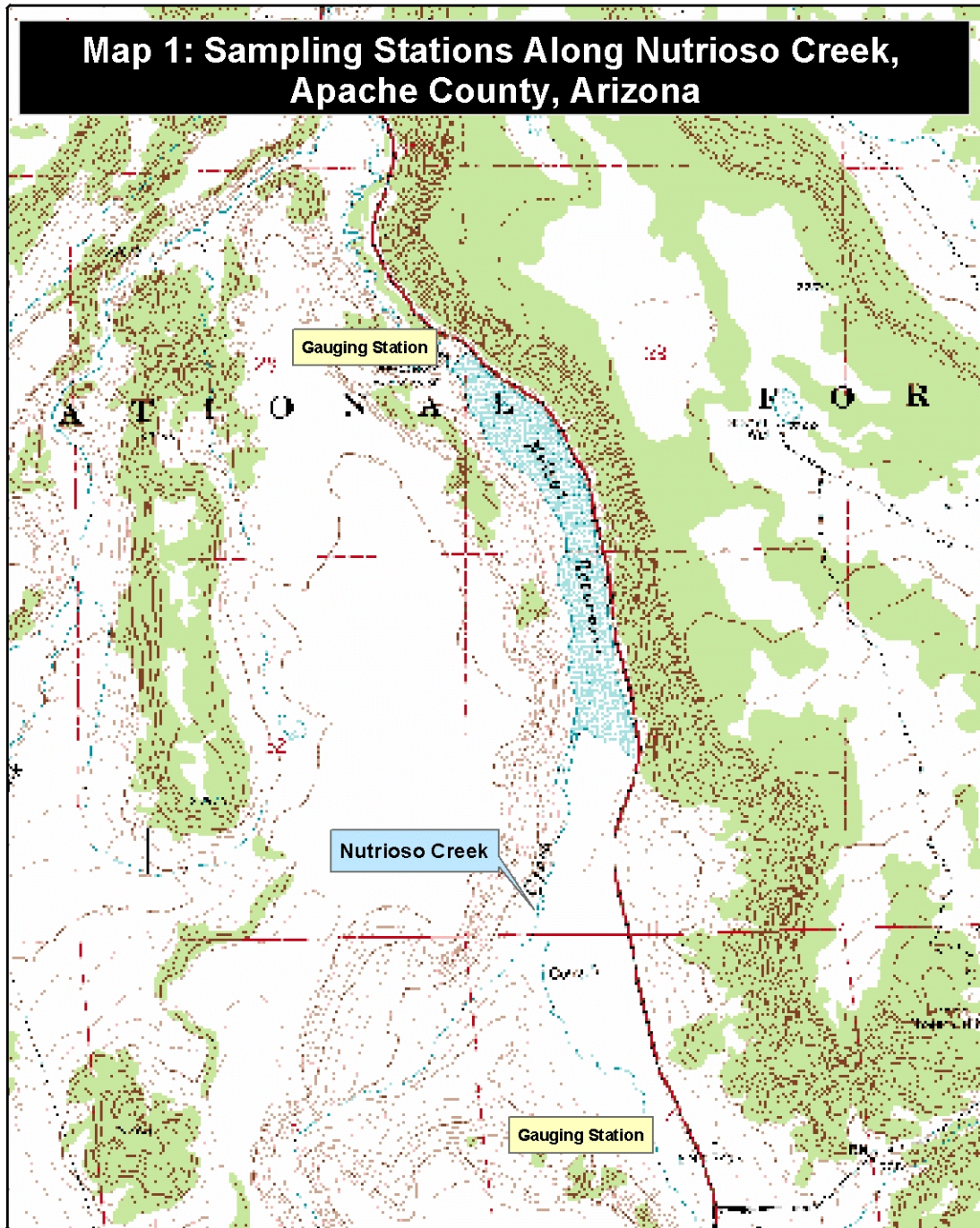
cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
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Project Leader, Fisheries Resources Office, Pinetop, AZ

John Kennedy, Arizona Game and Fish Department, Phoenix, AZ

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Appendix A



Appendix B Modified Minnow Trap Design

